'PHYTOCHEMICAL INVESTIGATION AND ANTIHYPERGLYCEMIC EFFECT OF SOME MEDICINAL PLANT EXTRACTS IN DIABETES AND ITS COMPLICATION'

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ABSTRACT

In Traditional systems of medicine, many plants have been documented to be useful for the treatment of Diabetes. Diabetes is a common disease that is rising in prevalence worldwide with the highest prevalence in industrialized countries. Diabetes affect about 300 million people worldwide and it has been estimated that a further 100 million will be affected by 2030. Since the ancient times, plants have been exemplary sources of medicine. In the last two decades the use of medicinal plants and natural products has been increased dramatically all over the world.

Current synthetic drugs used in pharmacotherapy of diabetic therapy lack satisfactory success due to adverse effect; hence patients are seeking complementary and alternative medicine to treat their Diabetes. Ayurveda and other Indian literature mention the use of plants in various human ailments. India has about 45,000 plant species and among them several thousand are claimed to possess medicinal properties. Researchers conducted in the last few decades on the plants mentioned in ancient literature or used traditionally for Diabetes have shown anti- Diabetic activity. The phytochemical research based on ethanopharmacology is considered as effective approach in discovery of novel chemical entities with potential as drug leads. With this view present study is aimed for "**PHYTOCHEMICAL INVESTIGATION AND ANTIHYPERGLYCEMIC EFFECT OF SOME MEDICINAL PLANT EXTRACTS IN DIABETES AND ITS COMPLICATION**."

SECTION 01

INTRODUCTION

Diabetes mellitus is one of the most common chronic diseases in nearly all countries, and continues to increase in numbers and significance, as economic development and urbanization lead to changing lifestyles characterised by reduced physical activity, and increased obesity. Estimates of the current and future burden of diabetes are important in order to allocate community and health resources, to emphasise the role of lifestyle, and encourage measures to counteract trends for increasing prevalence. A worldwide prevalence of diabetes (type 2 diabetes and type 1 diabetes) will increase by 54% to more than 54.9 million population between 2015 and 2030. Diabetes Mellitus leads to abnormalities in carbohydrate, protein and lipid metabolism and increases the risk of developing atherosclerotic arterial disease by two- to six-fold. Serum total cholesterol, triglycerides and LDL levels are seen to be increased in diabetes. Diabetes mellitus also disturbs the liver function, due to which the levels of SGOT and SGPT are increased in the blood; beside this nephropathy is a major problem in Diabetes Mellitus.

In the treatment of Diabetes Mellitus non-pharmacological measures (diet, exercise, and weight loss) remains a critical component of therapy. Along with this Dietary management includes the use of traditional medicines that are mainly derived from plants. Even now approximately 50-80% of the world population is almost entirely dependent upon traditional medicines.

Medicinal plants are of great value in the field of medicine and cure of diseases. Practical experience and several modern research studies have shown that therapy using plants is better than using synthetic chemicals by being safer besides having synergistic effect of their active ingredients and presence of certain minerals and salts. There is still large number of medicinal plants in which all active constituents have not yet been investigated even though their medicinal effect is established by folklore and traditional system of medicine. There are numerous traditional medicinal plants which reported to have hypoglycemic properties such *Allium cepa, Allium sativum, Aloe vera, Cajanus cajan, Coccinia indica, Caesalpinia bonducella, Ficus bengalenesis, Gymnema sylvestre, Momordica charantia, Ocimum sanctum, Pterocarpus marsupium, Swertia chirayita, Syzigium cumini, Tinospora cordifolia* and *Trigonella foenum graecu* (Goyal, 2008)

SECTION 02

REVIEW OF LITERATURE AND DEVELOPMENT IN THE SUBJECT (PREVIOUS WORK DONE IN THE RELEVANT AREA)

- Mohamed Bnouham *et al* 2006 reported Medicinal plants with potential Antidiabetic activity - A review of ten years of herbal medicine research (1990-2000)

- Mishra Shanti Bhushan *et al* 2010 reported an analytical review of plants for Antidiabetic activity with their phytoconstituents & mechanism of action.

- Jawaid T., *et al* (2014) has reported that Pumpkin seed extract having antidiabetic, antitumour, antibacterial and anticancer activity. It has also found to have strong hypotriglyceridemic and serum cholesterol lowering effect.

- Mayank Kumar et al, (2014) in their review show that medicinal plant used for treatment of diabetes have shown anti-diabetic activity.

- Chitra Jain et al., (2014) in this study revealed that Anti-diabetic potential of flavonoids and other crude extracts of stem bark of *Mangifera indica* Linn: A comparative study.

- Acharya J., *et al* (2015), has reported that evaluation of antidiabetic, antihypertensive, neuroprotective potential of flowers of *Cucurbita maxima* which shows that inhibitory activity against a-glucosidase, acetylcholinesterase involved in memory impairment. The Anticancer, hepatoprotective, anthelmintic, immunomodulatory, antibacterial, antihypercholesterolomic and antinflammatory activities of this plant have been put in to investigations concerning aerial parts and fruits.

- Jaychitra J., *et al* (2015) has reported that the Pumpkin seed contain many valuable functional components and have been used for therapeutic as well as clinical application. Pumpkin seeds used as diuretic agent, anti-diabetic agent, reduction of bladder and urethral pressure and improving bladder compliance.

- Prabhakar Kumar Verma, et al (2017) in this study revealed that Phytochemical Evaluation and Antidiabetic Potential of Trichosanthes Dioica Roxb. in Streptozotocin Induced Diabetic Rats.

- A.W. Siddiqui et al (2018) aqueous extracts of S. cumini and G. sylvestre (200 mg/kg) decrease the blood glucose levels in STZ diabetic rats. Study indicates that the aqueous extracts of S. cumini and G. sylvestre exhibited activity both in normal and streptozotocin-induced diabetic rats and also increased the tolerance of animals on oral glucose tolerance test.

- Naheed Akhtar et al (2018) in this study revealed that antidiabetic activity of *Ipomoea batatas* L. extract in alloxan-induced diabetic rats. They show that significantly decrease in glucose level in rat.

Such other literatures reveals numbers of medicinal parts are claimed in traditional system for its effectiveness in Diabetes Mellitus but not for their diabetic complication. Therefore we thought it worthwhile to design the present study with an objective to explore medicinal potential i.e. anti-diabetic effect of some herbal plants.

SECTION 03

OBJECTIVES OF RESEARCH

Diabetes is a common disease that is rising in prevalence worldwide with the highest prevalence in industrialized countries. Diabetes affects about 300 million people worldwide and it has been estimated that a further 100 million will be affected by 2025. In this modern era for primary health care, most of the world populations still use herbal medicine because of its better cultural acceptability, better compatibility with the human body, and lesser side effects.

With an objectives -

i) Phytochemical investigation and standardization of some selected medicinal plant extracts and characterization of extracts for presence of phytoconstituents.
ii) Toxicity studies of plant extracts.
iii) Preclinical Pharmacological evaluation of some medicinal plants for Antihyperglycemic effect and its complication.
iv) Preparation of Formulation.
v) Evaluation study of Formulation.

SECTION 04

METHODOLOGY TO BE ADDOPTED

1. Collection of plant material:

The whole plant or its parts will be collected from the known sources. The sample will get identify and authenticate by the botanist of region.

2. Processing of plant material:

Collected plant material will be subjected to processing such as drying, grinding, sieving etc as per official standards.

3. Pharmacognostic evaluation of plant material:

Whole plant or its parts will be subjected to Pharmacognostic evaluation for Morphological Evaluation and Microscopic evaluation and powder characteristics.

4. Extraction of plant material with various solvents:

Coarse powder form of plant material will be subjected to successive extraction. The solvent & extraction method will be decided according to chemical constituents & its nature.

5. Phytochemical Screening of plants extracts:

i. Determination of Alkaloids, Amino acid and Protein, Carbohydrates, Glycosides, Tannins, Flavonoids and Steroids.
ii. TLC fingerprinting

6. Pharmacological Screening of Plant extracts:

Plant material extracts will be evaluated for i.e. Determination of Acute oral & repeated dose toxicity:

i. Acute oral & repeated dose toxicity studies will be carried out for plant extract as per official guidelines like OECD.
ii. Pharmacological screening for antioxidant activity of plant extracts will be carried out.
iii. Pharmacological screening for antihyperglycemic activity by Alloxan induced and or Streptozotocin induced diabetic animal model as per reference standard methods.
iv. Diabetic complication against hepatic and nephropathy complications will be carried out in diabetes induced animal model.
v. Preparation of Formulation.
vi. Evaluation study of Formulation

SECTION 05

IMPORTANCE OF STUDY/ SOCIETY APPLICATION

Herbal medicine, as a major part of traditional medicine, has been used in medical practice since antiquity and is a common element of ayurvedic, homeopathic and naturopathic medicine. World Health Organization (WHO) notes that 74% of the plant derived medicines are used in modern medicine, in a way that their traditional modern application directly correlates with their traditional use as herbal medicines by native cultures. WHO estimates that 65% of the world's population uses traditional medicines as their primary form of health care and about 85% of traditional medicines involve the use of herbal preparations. The global market of herbal drugs at present is approximately $ 600 billion.

Nearly 8–10% of the world population suffers from diabetes. The synthetic drugs produce side effects. Therefore, there is a dire need to identify effective and safe remedies to treat diabetes. The current accepted modern medicine or allopathy has gradually developed over the years by scientific and observational efforts of scientists. However, the basis of its development remains rooted in traditional medicine and therapies. Herbal medicines are being used by nearly about 85% of the world population, primarily in developing countries for primary health care. Assessing the current status of health care system in adequacies of synthetic drugs is likely to be more glaring in the coming years. It has been reported that there has been an alarming increase in number of diseases and disorders caused by synthetic drugs prompting a switch over to traditional herbal medicine (Rana., 2008).

According to World Health Organisation (WHO) estimates 415 million people suffer from Diabetes, 1.6 million people died in 2016. Diabetes creates a substantial burden on individuals and families as it is more often under-diagnosed and undertreated. In India, an estimated that 346,000 deaths were attributed to Diabetes in 2015 (WHO 2015) and it was seen as one of the leading cause of morbidity and mortality in rural India. India has a rich cultural heritage of traditional medicines. The crude drugs being always available easily in abundance, comparatively cheaper, with negligible side effects and have frequently been prescribed to patients of all age groups.

SECTION 06

PROPOSED WORK PLAN

1. Collection, Identification and Authentication of selected Medicinal Plant material.

2. Processing of crude drug

3. Pharmacognostic evaluation of plant material

a) Morphological Evaluation

b) Microscopic evaluation and powder characteristics

4. Extraction of plant material:

a) Selection of Extraction method

b) Selection of Solvent

5. Phytochemical Screening of plants extracts:

a) Phytochemical Screening of both qualitative and quantitative analysis for

i) determination of extractive value & ash content

ii) Acid & Water soluble ash

iii) Foreign matter

iv) LOD

v) Heavy metal content

vi) TLC fingerprinting of extracts and standardization of extracts by estimating total Carbohydrates, Proteins, Lipids, Triterpenoids, polyphenols, flavonoid, saponin, alkaloids, glycosides, steroids content etc.

6. Pharmacological Screening of selected plant extracts for:

i) Safe dose calculation by acute oral toxicity studies and repeated dose toxicity study

ii) Pharmacological screening for antioxidant activity

iii) Anti-hyperglycemic and Diabetic Complication.

iv) Preparation of Formulation.

v) Evaluation study of Formulation.

7. **Interpretation of data and its presentation**

YEAR WISE PLAN OF WORK AND TARGET TO ACHIEVE

Present study is designed in such a way that it will come to a conclusive outcome within 03 years from the date of Allocation. The year wise plan includes**.**

YEAR 01

Literature survey, Plant Collection and preliminary screening, Morphological and Microscopic evaluation, Drying, Powdering, Physical evaluation of powdered drug will be carried out.

YEAR 02

Extraction of the plant material will be carried out by suitable method of extraction, phytochemical evaluation of extracts/ fractions by different qualitative and quantitative methods of evaluation (as per WHO guidelines). *In vitro* Pharmacological screening of different extracts for anti –oxidant activity

YEAR 03

In vivo screening of anti -diabetic activity of different extracts on suitable animal model and by evaluating various parameters. The active components present in the extract which will show maximum promising anti-diabetic effect, Preparation of Formulation, Evaluation study of Formulation, Compilation, interpretation of data and thesis writing.

SECTION 07

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